AMRAD NEWSLETTER

Amateur Radio Research and Development Corporation November 1980

OUR NOVEMBER 3 MEETING will feature a talk by Joel Nelson entitled "How to Interface with the Telephone Company--Book II;" a follow-on to his May talk. The meeting will be at 7:30 p.m. at the Patrick Henry Branch Library, 101 Maple Ave E, Vienna, VA.

NOMINATIONS WILL BE OPENED for AMRAD Directors at our November 3 meeting. This year, the 1979-1980 terms of Jeff Brennan, WB4WLW and Bill Pala, WB4NFB will be expiring, as will be the 1980 terms of Alternates Ken Coghill, WB4ZOH and Sandy, WB5MMB. Four or more nominations will be needed. Nominations may be made by any paid-up member either at the November 3 meeting or by mail to AMRAD, 1524 Springvale Avenue, McLean, VA 22101.

Continuing as Directors in 1980-1981 terms of office are Bob Bruninga, WB4APR, Terry Fox, WB4JFI, and Paul Rinaldo, W4RI.

Election of two Directors and two Alternates will take place at our Annual Meeting which will be on December 1 this year.

A 440-MHz REPEATER will be one topic for discussion at the annual meeting. AMRAD was fortunate to receive a donation of the better part of a 440-MHz repeater from new member Chuck Phillips, K5LMA. It is now in the hands of Jeff Brennan, WB4WLW, and Sandy, WB5MMB. We have a number of the usual problems such as selection of an antenna and cavities. But, probably the most important consideration will be whether to configure it as a normal transparent audio repeater or as a data repeater. Dave Borden's comments on packet repeaters in his Protocol column should be food for thought. We also need to talk about this new 440 repeater in light of a potential HF packet node which could be used for experimental communications with the Vancouver group.

THE AMNET CONCEPT for an amateur computer network should be ready for discussion at the annual meeting. If you haven't heard of it, AMNET is an idea of an amateur network for (ASCII) hams, computer hobbyists and possibly the deaf.

10.1 MHz OPERATION BY TWO CANADIAN Amateurs has been approved by the Department of Communications and should be authorized very soon. In response to a proposal by VE3QB, the DoC has agreed to issue him and VE3DPB VE9 licenses in the experimental services and permit them to operate using very narrow band, low bit rate digital communications anywhere in the 10.1-10.15 MHz future Amateur band. They'll be experimenting with digital data transmission in the presence of QRM, and are prepared to set up for possible 24-hour-a-day communications using computer-controlled stations.

Operation On Any Frequency within the 50-kHz-wide band will be permitted the two experimenters, as the 5-watt limit on output power is unlikely to cause other band occupants problems. As both stations are in the Ottawa area, propagation between them should not be a factor, but the effects of propagation on other interfering signals should provide useful information on problems of digital data communications on the HF bands.

Their VE9 Experimental licenses will be valid for a year. Regular Amateur use of 30 meters is not scheduled to begin until January 1, 1982. Thanks *HR Report*.

CALL FOR PAPERS

The 1981 ARRL Technical Symposium will be held Monday evening, April 6, 1981 at the Capital Hilton, Washington, DC in association with the IEEE Vehicular Technology Society Annual Conference which runs April 6 through 8. We are looking for technical papers on amateur mobile communications technology and other technical subjects of interest to amateurs. More details concerning deadlines, etc. will be announced later. If you think you might be interested in giving a paper, please contact Paul Rinaldo, W4RI, 1524 Springvale Avenue, McLean, VA 22101, 703-356-8918.

NCC'81 Personal Computing Festival to be held in Chicago, May 4-7, 1981 is looking for papers. Letters of intent to give a paper are due by December 1, 1980 in the hands of James Gerdes, Argonne National Laboratory, 9700 Cass Avenue, Argonne, IL 60439. The letter of intent should include an abstract and a brief biography.

THE SPREAD SPECTRUM SPECIAL INTEREST GROUP is making progress. The following information was supplied by the SSSIG secretary, Hal Feinstein, WB3KDU, 1310 Court House Rd N, Arlington, VA 22201, 703-524-9116.

The first draft of the request for Special Temporary Authorization (STA) was completed and is now being reviewed. Thanks to AMSAT for making the going easier by providing us with a copy of their recent STA request.

So far three experiments are being considered:

(1) direct sequence spread spectrum in the 420-MHz band;

(2) frequency hopping spread spectrum in the 10-meter band; and,

(3) frequency hopping using a commercial rig in the HF bands.

Peter Driessen, VE7BBQ was in the Washington, DC area recently and talked with Paul Rinaldo, W4RI about packet radio, spread spectrum and other topics. Peter is a Director of CARF and is involved in packet radio experiments in Vancouver. Peter has suggested that it may be possible to frequency hop with the ICOM 701 which both Peter and Paul have. What we are looking at presently is a way of synchronizing and code generation. We are not sure at this point of the settling time on a new frequency, so there is much additional work to be done. Peter's address is: 203-1949 York Avenue, Vancouver, BC, Canada V6J 1E3.

A few of the SSSIG people have been writing articles on spread spectrum for various ham publications. Paul Rinaldo, W4RI, has written a nice article on "Spread Spectrum and the Radio Amateur," which has been accepted for publication in the November issue of *QST*. John Nagle, K4KJ, is working on an article for *Ham Radio*. We have a number of requests from other publishers; please drop me a line if interested.

I am planning to do an article on spread spectrum coding techniques for the *AMRAD Newsletter*.

We received a letter from Jim Osburn, WB9EYB saying that he had to take time out to build a computer. Obviously, a computer will be of great help in developing spread spectrum systems. We thought that might be the last we heard from Jim, judging by the way others have disappeared for a year or two after such a pronouncement. However, Jim said that he has finished building his computer. It is Z-80 based and has one 2716 for 2 k of ROM and two 2114's for 1 k of RAM. It's only five chips, but he has already programmed it to play music and to be an AFSK generator for RTTY.

Spread spectrum is a mode of radio communications originally developed for military applications. It features a unique ability to avoid detection by conventional receivers. This was the main motivation, but as with some other well known inventions, other interesting properties were observed after a time. These properties make spread spectrum an unconventional solution to today's crowded bands.

The spread spectrum mode of transmission features a very wideband signal, one which is 10 to 100 times the information bandwidth. Normal modulation techniques try to pack as much information as possible into a narrow band. A conventional receiver limits its bandwidth to that of the incoming signal to improve the signal-to-noise ratio. Spread spectrum spreads the signal over a large but controlled bandwidth.

Because the signal is spread out, narrow band interference is still present but reduced in its effect. This is because the spread spectrum receiver is gathering power from the entire bandwidth, not just the narrow window of a conventional receiver. This creates an antijamming (AJ) property for military applications and anti-interference feature for anyone's applications. In a frequency hopping (FH) system (one type of spread spectrum), the receiver's RF window is constantly hopping around in synch with the transmitter. If there is a narrow band signal in the band, the window will fall on that signal only in a random fashion.

Interference between spread spectrum and conventional users will generally be very small. The spread spectrum signal is designed to be invisible to normal receivers. Thus, there is a good chance that spread spectrum and conventional users can share the same spectrum space. Another feature of spread spectrum worth mentioning is that each spread spectrum unit employs a random like code which is used to hop the frequency around. Two units that have different codes cannot hear each other. If two units have the same code, they have a kind of private channel, but the channel is not a fixed frequency -- it is constantly moving. Thus, spread spectrums offers a new and interesting channelization scheme.

The challenge to amateur radio is to construct equipment that can use spread spectrum modulation. It is not the kind of mode where you can order a rig from a mail order house. It will require some real innovation to develop practical systems.□

FOR SALE: Polymorphic 8813 microcomputer with two 5-inch floppy disc drives and 40 k of RAM. Asking $2,800. Paul Hoffman, Jr., W3JSN, (301) 550-4700 (work), (301) 831-7433 (home).

THE ADWAR APPLE PROC MOD is a circuit board which plugs into Slot #7 of the Apple II to permit video tape recording without loss of color. The Apple uses a nonstandard scanning rate of 524 lines per frame. The Adwar board has a signal processor which stores in solid state memory an entire Apple frame and reads it out at the proper video 525 lines for NTSC video equipment. For further information contact Adwar Video, 100 Fifth Avenue, New York, NY 10011, (202) 691-0976.

NOVATION, 18664 Oxnard St, Tarzana, CA 91356, (213) 996-5060 has announced a new directly coupled 100-series modem called D-CAT..

THE DEAF AND THE TTY

Barry Strassler
Executive Director
Telecommunications for the Deaf, Inc.
814 Thayer Avenue
Silver Spring, Maryland 20910
TTY 301-589-3006

THE GROWTH OF THE TTY NETWORK

In 1968, an agreement was negotiated between the Alexander Graham Bell Association for the Deaf (AGBAD) of Washington, DC and the American Telephone and Telegraph Company (AT&T) on the donation of surplus model 15 machines.

The AGBAD, basically an organization promoting the use of speech among deaf school children, were unable to tend to the physical handling of these donated machines. Thusly, a new organization was formed, the Teletypewriters for the Deaf Distribution Committee of Indianapolis, IN. The driving force behind this new entity was Dr. H. Latham Breunig, now of Arlington, VA. He just about single-handedly led the growth of the teletypewriter network. The TDDC changed its name, ultimately to the TDI.

These were the "wild and woolly days". Machines were given freely to TDI agents, dispersed across the country. These agents became overworked, trying to find storage space for these machines, attending TTY repair classes, selling Weitbrecht modems, locating members for the TDI, etc. They were the yeomen of their deaf communities. They were unable to attend local deaf gatherings - social events, parties, church services and such - without being harassed by customers demanding attention with their problem machines.

AT&T and Communication Carriers seemed to have an inexhaustible supply of model 15 and 19 machines, and many agents had to turn down the largesse due to space limitations in their basements, back yards and garages, or even in rented warehouses. Some organizations such as the Pioneers, churches, the Lions, social service agencies helped out with their resources.

Consequences were sometimes tragic. One telephone company reportedly dumped the machines into the ocean due to the lack of takers. One lady entrepreneur (not deaf) obtained use of a Federal warehouse, gratis, to store her hoarded supply of 300 machines only to have a fire demolish the property. Some agents waged territorial raiding wars on the donated machines.

Two events marked the sudden end of the salad days - a law suit was waged to force AT&T to donate machines to any non-profit organizations, and not just the TDI. This caused the AT&T to cease the easy donation of machines since some machines ended up in the hands of organizations not equipped to handle them. The second event was the depletion of these machines.

All good times must come to an end, and beginning in the late seventies, TDI agents had to scrounge around for machines they once had by the truck loads.

PROTOCOL

David W. Borden, K8MMO
Rt 2, Box 233B
Sterling, VA 22170
703-450-5284 (Metro No.)

NEWS HEADLINES

First thing this month we have some events to take note of and then the main article.

On Monday, April 7, 1980 the first Ottawa packet radio repeater (VE3RMR) became operational. This month's article is devoted to this subject. It is a repeater unlike what one expects hardware-wise. Thanks to the CARF Packet Radio Newsletter for this tidbit.

The Vancouver Amateur Digital Communications Group (VACDG) has been operating an HF beacon on 14.0765 MHz using transmissions of HDLC protocol, 35 seconds every five minutes. This beacon was heard across Canada and usually put a good signal into Ontario. The beacon transmitter was a Kenwood TS-900 which was not owned by VADCG and thus could not be modified. The organization has now purchased a Collins model 32RS-1C to be used on the beacon. This note is from the VADCG September 9, 1980 newsletter, and they hope to have it running before the next newsletter comes out. The club has obtained the special call sign VE7PKT for the new beacon when it becomes operational. What all this really suggests is the linking of individual packet repeaters on HF. Paul Rinaldo (W4RI) has been in touch with Doug Lockhart concerning this subject. If AMRAD ever gets a (packet) repeater on the air, it should have an HF port to link with the gang up North.

The VADCG has just completed a new batch of Terminal Controller Boards, one of which I received on October 15. These boards are well done and cost $32. If anyone is interested, they will supply the specifications and circuit board diagrams free. This is not an inexpensive project however. The major chip used is the 8273 SDLC chip from Intel and appears to be no cheaper than $67 in the few places listing it. I am going to build up this board just as a means to get off the ground. In addition, it will be useful for listening to the beacon, using on the Northern gateway when AMRAD gets a repeater going, etc. What is really needed is someone to design and build an S-100 (SS50/ Apple/Radio Shack/Pet versions later) board that uses a less expensive chip such as the mortola 6854 Advanced Data Link Controller ($30 range). The majority of these experiments are *software*. Why should the hardware be intimidating to the beginner?

The TIP and LIP software for the VADCG board is being published in source form in the newsletter. This should allow a good starting point for AMRAD experiments. They now say it has been tested and in use nightly on 145.65 terminal to terminal. A station node is activated as funds permit. This is a 1200-baud Bell 202 modem, digital-to-audio tone modulation/demodulation scheme.

The Ottawa group claims that path testing has begun between Ottawa, Saskatoon, Vancouver and Greenwood, NS using VE3RMR as a distributor/concentrator.

PACKET REPEATERS

VE3RMR, the Ottawa Packet Radio Repeater, is now operational. They refer to this 220 MHz single-frequency machine as a "DIGI-PEATER". It operates simplex with T/R switching times of approximately 1 ms using a pin diode (MA8334) to do the switching. No audio/modems are involved in the operation; F1 frequency-shift keying is employed, and "on" time for the repeater is 50-250 ms to send a packet. They employ 9600 bps and have done considerable work on a VHF Engineering TX220B in order to make it work properly. Consult Fig. 1 to observe the simple hardware configuration.

To the FM repeater groups using traditional hardware, it is not clear that this

machine is a repeater, but it is. It is very inexpensive and easily reproducible. The repeater hardware is essentially the same as normal packet terminal station hardware, except for the software program loaded into its memory.

The repeater has a number of unique features. The software is reloaded from a control station following a power failure. Thus, the software is changeable at any time without need to visit the repeater site. One could of course PROM the program and just swap PROMs on the way home from work, but it does not work that way in practice.

One thing that AMRAD could benefit from is the rejected ideas of the Ottawa repeater. They did not choose to use digital-to-audio tone modulation/demodulation techniques (modems). They wanted to achieve 9600 bps and thus inexpensive modems were left out of the design. If we study the diagram in Fig 1, we see that the modulator could be replaced by the send half of a Bell 202 modem, and the demodulator could be replaced by the receive half, because most 202 modems allow four-wire operation (as discussed in this column last month).

The single most outstanding idea of the Ottawa group is really not new; they just emphasize it so. The repeater can employ the exact same inexpensive hardware that the terminal node end users employ, only the software downloaded by the control station is different to account for the packet having passed through a smart repeater.

It is possible to get one of these simple repeaters on the air with very little work. It could be very easy. A study of the Montreal group packet suggests that they do not use one of the expensive, smart chips, but rather just a normal microcomputer with a serial port. They do not do a Cyclic Redundancy Check (CRC) as Vancouver does, but rather a form of vertical parity. They are running 2400 bps and essentially Motorola 6800 machines which cannot do a CRC. They are currently looking at a Fairchild 9J401 CRC generator/checker to perform this function, but their frame check is XOR. This leads to instant experimentation.

I have started looking at my two-meter mobile rig which uses solid-state switching. Perhaps it could be made into a repeater easily. I will be looking at this idea and thinking of 450 MHz also as there is a possibility of AMRAD getting a 450-MHz repeater. I should hope that we would make it a pure data repeater, accepting only Bell 202 modem tones and no voice. We could CW ID the 1200 Hz tone every 10 minutes. Any ideas from our readers out there are highly desired. Data signals on the repeater are also highly desired.

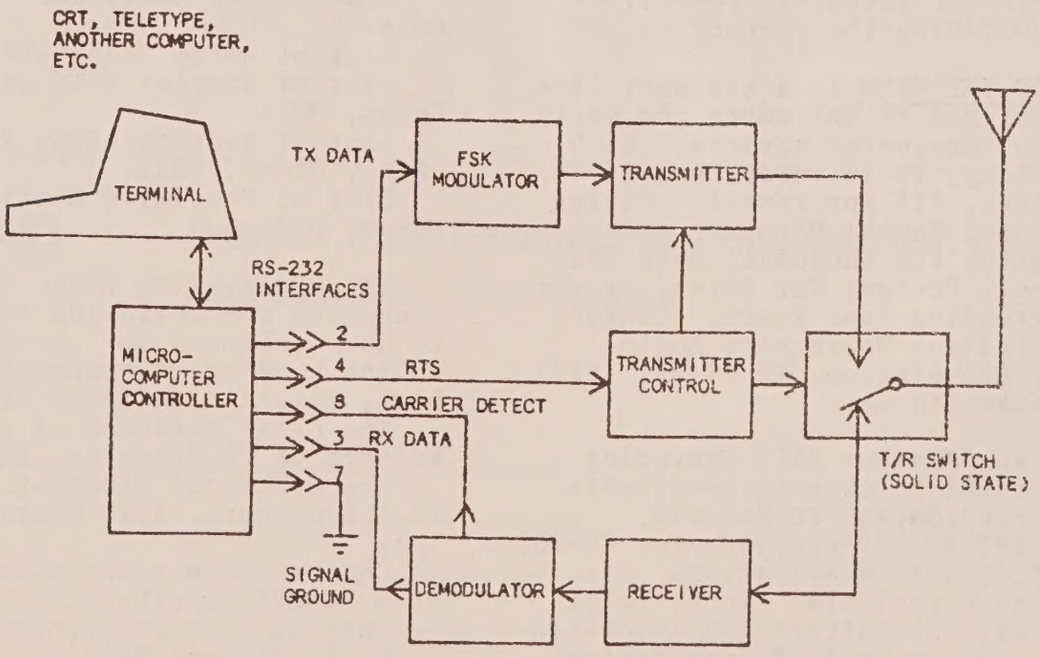

Fig. 1 - Basic Digipeater Configuration

COMPUTER-ORIENTED HAM RADIO NETS were listed in our August issue. Here is an updated list:

Type	Day & Time	Freq. (kHz)
Apple	Sun, 9 p.m. EST	14329
Apple E Coast	Sat, 1300 GMT	7260
Apple Boston	Wed, 8 p.m. EST	144.65/145.25
Atari	Mon, 0100 GMT	14329
Digital Group	Sat, 11 a.m. EST	14281
	Sat, 5 p.m. EST	7190
SWTP-6800	Sun, 9 p.m. EST	14250
TRS-80	Sun, 3 p.m. EST	14342
	Sun, 6 p.m. EST	14342

If you have any corrections to the above information or additional listings, please let us know.

THE BELL TELEPHONE SYSTEM plans to greatly increase use of satellites for domestic long-distance telephone calls. The additional propagation delay may be a problem for certain data communications users. The ones affected are: over 500 miles, dial-up calls, half-duplex modems, those using "inquiry-response" type operations. Some modems will have trouble passing "delayed echo" onto the terminal as legitimate data (i.e., Bell 202 data sets using reverse channel, 208B data sets or equivalents). Bell 201 or 202 data sets without reverse channel may experience a "first transmission" echo when used with satellites. Those data systems which automatically abort each call attempt on a failure at first transmission may need procedure changes to establish automatic retrail without reestablishing the connection.

ADVENTURE OF THE MIND is a six-part 16mm film series designed to introduce the world of computers to interested novices. Each is 15 minutes long, is in color, and costs $240 for purchase, $15 for rental. Titles are: The Personal Touch; Hardware and Software; Speaking the Language; Data Processing, Control, Design; For Better or for Worse; and, Extending your Reach. Contact Chris Wagner, Indiana University Audio-Visual Center, Bloomington, IN 47405, (812) 337-8087. Thanks Sid.

ROM-116 is an "Amateur RTTY Operating System" for the TRS-80 computer available from Crown MicroProducts, PO Box 892, Maryville, WA 98270. It provides for Baudot RTTY, ASCII RTTY, and CW operation. Its features include a real-time clock, split-screen video, several buffers and automatic CW ID control. Price is $260 less cabinet, $300 with, assembled and tested. It runs on a 16 k TRS-80. It has a built-in demod, but an external one such as the Flesher or ST-6 is recommended. Provide your own AFSK generator.

RCA ANNOUNCES the following new products:

Ultraviolet Erasable Asynchronous PROM - a 256-word by 8-bit static CMOS electrically programmable read-only memory, CDP18U42CD. Price $38.70, 100-unit rate.

Ten-Volt CMOS 4K Static RAM - CDP1825 1024x4 CMOS static RAM. 100-unit prices range from $16 to $55 each.

Serial Output ASCII Encoded Keyboards - Two 128-character ASCII encoded keyboards with asynchronous serial output, the VP-606 with a 58-key typewriter format and similar VP-616 with an additional 16-key calculator keypad. Units are priced $46 for parallel output and $65 for serial output (both with case).

CRT Terminal with Full-Screen Editing - COSMAC CRT Data Terminal, CDP18S040, 24 x 80 display, 73-character ASCII keyboard and 14 dedicated function keys. Price is $1195.

CMOS MICROBOARD COMPUTER - CDP18S604 low-power Microboard Computer; $199 each. It is a complete computer on a 4.5 by 7.5 inch card containing a CDP1802 CMOS microprocessor, 2-MHz clock, 512 bytes of read-write memory, parallel I/O ports, power-on reset, interface expansion area, and a socket for 1 or two kilobytes of user-selected ROM.

High Speed Matrix Printer - CDP18S050 340 cps bidirectional printer, $2995 each.

JOERG KLINGENFUSS, Panoramastrasse 81, Hagelloch, D-7400 Tuebingen 7, Federal Republic of Germany, has the following publications available for mail order. Prices below are in Deutch Marks.

Confidential Frequency List, DM15

List of Abbreviations, codes and Tables used in Radiocommunications, DM12.

List of Addresses of Utility Stations, DM11.

Call Sign List of Utility Stations, DM17.

Magnetic Tape Recording of Modulation Types, DM14.

List of Air Codes and Communications, DM26.

List of Meteo Codes and Indicators, DM16.

List of Special RTTY and CW Alphabets and Codes, DM18.

List of Radioteletype Stations in Frequency Order, DM25.

List of Facsimile Stations in Frequency Order, DM6.

TAB BOOKS, Blue Ridge Summit, PA 17214, announces the following titles of interest to our members:

The Complete Microcomputer Systems Handbook, Edward L Safford, Jr, $9.95 paperback.

The GIANT Handbook of Computer Projects, Editors of 73 Magazine, $9.95 paperback.

The Practical Handbook of Amateur Radio FM & Repeaters, Bill Pasternak, $9.95 paperback.

OSCAR: The Ham Radio Satellites, Dave Ingram, $4.95 paperback.

Antenna Data Reference Manual, Joseph J. Carr, $7.95 paperback.

MODERN ELECTRONIC CIRCUITS REFERENCE MANUAL, by John Markus, $44.50, is available from McGraw-Hill Book Co, PO Box 400, Heightstown, NJ 08520.

FOR SALE: 4 Processor Technology 16KRA 16 k dynamic memory boards. Three work, 1 doesn't. $100 each or all four for $300. With documentation. Terry Fox, WB4JFI, 1819 Anderson Rd, Falls Church, VA 22043, (703) 356-8334.

PROGRAMS FOR THE OSI C1P are available from Aardvark Technical Services, 1690 Bolton, Walled Lake, MI 48088:

RTTY for the C1P allows you to transmit and receive in Baudot code at selectable baud rates from 40 to 120. The screen driver can also be used to drive a Baudot TTY as a regular printer. This program is not for the beginner because it requires some interfacing. $14.95.

Morse Code Converter decodes Morse. It requires connection to a receiver. A diagram of the necessary hardware is included. Hardware cost should be less than $10, but it definitely is not for the inexperienced builder. Price is $14.95.

THE MICROPERIPHERAL CORPORATION has a new program to convert the TRS-80 into an intelligent terminal. SMART80C is cassette based. For additional information write: Box 529, Mercer Island, WA 98040 or telephone (206) 454-3303.

R.F. POWER AMPLIFIER DESIGN is the name of a new program for the Apple II written in Applesoft. It permits the user to design RF power amplifiers through use of micro stripline or lumped constants. Schematics are shown in high-resolution graphics with labels to show the component values. Price is $69.95 for diskette, description and examples. Order from: Computermart of California, 315C Diamond Bar Blvd, Diamond Bar, CA 91765.

CONTEST is an Applesoft program which not only logs amateur contacts but tells the operator whether he has worked a particular station before. $14.95 on cassette, $19.95 diskette from Al Jenson, WA7TIB, 19111 First Ave, Seattle, WA 98177.

VOLUNTEERS ARE NEEDED to help a Northern Virginia widow clear our her late husband's collection of amateur radio and TTY equipment. Work to be done includes inventorying the equipment, recommending disposition, and helping to sell some of it, possibly at the 1981 Vienna Winterfest^{tm}. Please contact Paul Rinaldo, W4RI, 703-356-8918.

TRANSMISSION CHARACTERISTICS OF SWITCHED TELEPHONE NETWORKS is a short course to be run by GWU January 19-23, 1981. It is designed for users of telecommunications networks and for managers, supervisors, technicians and others who are involved with providing services to the networks and to the domestic or international telephone industry. Fee is $695. For further information, please write to the Director, Continuing Engineering Education, George Washington University, Washington, DC 20052, or call (202) 676-6106 or (800) 424-9773.

THERE HAS BEEN MUCH DISCUSSION of Japanese vs American productivity and quality control in electronics and other industries. American Management Associations, 135 West 50th Street, New York, NY 10020 is holding a two-day meeting on "Using Japanese Quality Control and Productivity Techniques in U.S. Industry" on December 18-19, 1980 at their headquarters in New York. Fees are $435 for AMA members, $495 for others. If interested call (212) 246-0800.

A ONE-DAY SEMINAR on Requirements and Testing per FCC Docket 20780 is being held in Dallas Nov 5, Chicago Nov 12, Baltimore Nov 17, and Orlando Nov 24, by R&B Enterprises, Box 328, Plymouth Meeting, PA 19462, (215) 828-6236. On the day immediately following those above at the same locations, one-day courses will be given on Designing to Meet FCC Docket 20780. Docket 20780 regulates the conducted and radiated electromagnetic interference (EMI) from commercial computing devices. Devices not tested must carry a warning label, as of January 1, 1981.

AMRAD **Amateur Radio Research and Development Corporation**

Membership Application/Renewal

Mail to: Gerald Adkins, Treasurer
1206 Livingston St N
Arlington, VA 22205

Dues:	Annual	Life
Regular	$12	$120
2nd in family	6	60
Full-time student	3	-

Please make checks payable to AMRAD.

Name_____
Ham Call_____ Home Phone( )_____

Address_____
City,
State_____ ZIP_____

Class License_____ ☐ ARRL Member
Have: ☐ 2-meter FM ☐ RTTY
☐ Computer model_____
Microprocessor type_____

I agree to support the purposes of the Corporation.

*Signature*_____

THE AMATEUR RADIO RESEARCH AND DEVELOPMENT CORPORATION is a technically oriented club of about 300 radio and computer amateurs. It is incorporated in the Commonwealth of Virginia and is recognized by the Internal Revenue Service as a tax-exempt scientific and educational organization.

THE PURPOSES OF THE CLUB are to: develop skills and knowledge in radio and electronic technology; advocate design of experimental equipment and techniques; promote basic and applied research; organize forums and technical symposiums; collect and disseminate technical information; and, provide experimental repeaters.

MEETINGS ARE ON 1st MONDAY of each month at 7:30 p.m. at the Patrick Henry Branch Library, 101 Maple Ave E, Vienna, VA. If the 1st Monday is a holiday, an alternate date will be announced in the *AMRAD Newsletter*. Except for the annual meeting in December, meetings are normally reserved for technical talks - not business.

THE WD4IWG/R REPEATER is an open repeater for data communications (including RTTY), voice and experimental modes. It is located at Tyson's Corner, McLean, VA and has excellent coverage. It features a semi-private autopatch available to licensed members. Frequencies are: 147.81 MHz input, 147.21 MHz output. The head of the technical committee is Jeff Brennan, WB4WLW, 7817 Bristow Dr, Annandale, VA 22003, phone 703-354-8541.

THE AMRAD NEWSLETTER is mailed monthly to all members and to other clubs on an exchange basis. Technical articles, new product announcements, news items, calls for papers and other copy related to amateur radio and computing are welcome. Honorariums at a rate of $10 per printed page ($20 maximum per author per issue) are paid for original material accepted. Classified ads are free to members. Commercial ad inquiries are invited. The editor reserves the right to reject or edit any portions of the copy. Items should be mailed by the 8th of the preceeding month to Paul L. Rinaldo, W4RI, Editor, 1524 Springvale Ave, McLean, VA 22101; phone 703-356-8918. Full permission for reprinting or quoting items appearing in the *AMRAD Newsletter* is granted provided that credit is given. Mailing is by 3rd Class bulk mail to U.S. addresses and 1st Class to Canada and Mexico. Overseas readers add 60¢ for surface or $5.64 for air mail to annual dues.

THE AMRAD MESSAGE SYSTEM is an S-100 Computerized Bulletin Board System on 703-734-1387, system operator Terry Fox, WB4JFI. Terry's home phone number is 703-356-8334. The system accepts 110, 300, 450 and 600 baud ASCII callers using Bell 103-compatible modems.

THE HANDICAPPED EDUCATION EXCHANGE (HEX) is operated by AMRAD for those involved in education and communications for the handicapped. It accepts both 110/300-baud ASCII and deaf TTY callers. on 301-593-7033. The sysop Dick Barth, W3HWN's home phone is 301-681-7372.

AMRAD OFFICERS for 1980 are:

Gerald Adkins, N4GA	Treasurer
Jeffrey Brennan, WB4WLW	Director Repeater Trustee
Tedd Riggs, KA4FYU	Librarian
Robert E. Bruninga, WB4APR	Director VP-Asia
Kenneth Coghill, WB4ZOH	1st Alt.
Terry Fox, WB4JFI	Director Vice Pres. Computer Trustee
William Pala, Jr., WB4NFB	Director Secretary
Paul L. Rinaldo, W4RI	Director President
Elton A. Sanders, Jr., WB5MMB	2nd Alt.

THE AMRAD LIBRARY is operated by Tedd Riggs, KA4FYU, 8402 Berea Ct, Vienna, VA 22180, phone 703-573-5067. Donations of technical books, magazines, manuals and catalogs are tax-deductible.

AMRAD IS AFFILIATED with the American Radio Relay League (ARRL), the Foundation for Amateur Radio, the Northern Virginia Radio Council (NOVARC) and The Mid Atlantic Repeater Council (T-MARC).

SPECIAL INTEREST GROUPS are formed from time to time. Currently we have SIG's on Deaf Communications and Spread Spectrum Communications. If you are interested in joining or forming a SIG, please contact Bill Pala, WB4NFB, 5829 Parakeet Dr, Burke, VA 22015; phone 703-323-8345.

TRAINING CLASSES are run as needed. Please discuss your training requirements with any Director.

AMATEUR RADIO RESEARCH AND
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1524 SPRINGVALE AVENUE
MCLEAN, VA USA 22101

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